

THE ROUTE TO NET
ZERO.
TOGETHER TO
DECARBONISE THE
MARITIME SECTOR.



ASSARMATORI


CONFITARMA
Confederazione Italiana Armatori

RINA  **UNEM**
unione energie per la mobilità

 **FEDERCHIMICA**
ASSOGASLIQUIDI
Associazione nazionale imprese gas liquefatti

 **ASSOCOSTIERI**
LA LOGISTICA DELL'ENERGIA

 **MAN**
MAN Energy Solutions

 **WÄRTSILÄ**

WIN GD

eni 

The template of this presentation was created by minimizing the use of colors/images, in order to reduce the environmental impact of the printed document.

With the hope of promoting its maximum diffusion, you can download a copy in pdf format by scanning the QR Code.



THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

ASSARMATORI

CONFITARMA
Confederazione Italiana Armatori

RINA UNEM
unione energie per la mobilità

FEDERCHIMICA
ASSOGASLIQUIDI
Associazione nazionale imprese gas liquefatti

ASSOCOSTIERI
LA LOGISTICA DELL'ENERGIA

MAN
MAN Energy Solutions

WÄRTSILÄ

WINGD

eni

Participated in the document drafting:



CONFITARMA

Confederazione Italiana Armatori

Fabio Faraone
Francesco Beltrano



Stefano Beduschi
Enrico Allieri



Andrea Cogliolo
Maria Garbarini
Giovanna Carosi



Teresita Valentini
Antonella Bovi
Maria Ilde Colasuonno
Stefano Iacovetti
Natascia Falcucci
Renato De Filippo
Paola Mainetti
Giorgia Bozzini
Federico Mauri
Gabriele Stefanelli
Stefano Grimaldi
Antonio Taranto
Giuseppina Pisaniello
Elena Maria Rebesco
Roberto Cipolletta
Alessia Sacco



FEDERCHIMICA

ASSOGASLIQUIDI

Associazione nazionale imprese gas liquefatti

Silvia Migliorini
Matteo Lentini



unione energie per la mobilità

Marina Barbanti
Franco del Manso



MAN Energy Solutions

Andrej Stopar
Andrea Salemi
Marco Camotti



ASSOCOSTIERI

LA LOGISTICA DELL'ENERGIA

Dario Soria
Federico Rossi



WÄRTSILÄ

Stefano De Marco
Carlo Contessi
Piero Zoglia
Giulio Pacini



Dino Gravina
Andrea Lazzaro
Carmelo Cartalemi



THE ROUTE TO NET ZERO

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



- The maritime sector, which has experienced considerable growth over the years, is the backbone of the global economy, considering that 90% of goods are transported by water, and it generates about 3% of the world's total climate-changing emissions.
- Eni, together with the shipowners' associations (Assarmatori and Confitarma), promoted the project "The route to net zero. Together to decarbonise the maritime sector". The three largest manufacturers of marine engines (Man Energy Solutions, Wärtsilä and WinGD), Assocostieri, Federchimica/Assogasliquidi and Unem also participated in the project. The supervision was carried out by RINA.
- The KoM took place on March 16th 2023 and, after 4 months, the decarbonisation roadmap was presented, optimizing the cost curves, with short and medium-term objectives, in order to allow shipowners to respond to the targets of the FuelEU Maritime Regulation, IMO , ETS and other further obligations.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



To meet the EU and IMO targets, a strong acceleration and, at the same time, far-sightedness in adopting the most suitable choices, are required. The solutions will be determined by

- investments in technologies and infrastructure, as well as by the opportunities of the regional areas connected to the different types of transport and the different acceptability of the risk.

The great potential of the maritime sector finds a concrete answer in the principle of technological neutrality, highlighting that there is no effective competition between the various

- energy vectors, but that all can contribute to replacing the fossil bunker that powers 99% of marine vessels (and the 95% of the tonnage) of the world fleet, respecting the type of traffic, the characteristics of the engines, the refitting, etc.

- In order to respond to this demand for decarbonisation in the short term, biofuels (especially liquids) will make a substantial contribution. In the medium and long term, it will be necessary to boost the production of other types of fuels as well.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



- The regulatory interventions of the European Commission enable the competitiveness of low-carbon energy vectors, and the effectiveness of these interventions will be guaranteed by the harmonization of the internal market within the EU and by creating the conditions for being competitive in non-EU areas.
- The maturity of marine engine technologies has shown an ability to respond immediately to the shipowners' needs, in particular the ship on order is oriented towards the solution of dual fuel engines that make refueling and adaptation to market dynamics more flexible
- Mono Fuel engines, assisted by CCS, could also play an important role in the medium/long term. The incremental solution is the Dual Fuel ad LNG which will progressively be joined by methanol and ammonia, the latter two preferred solutions in geographical areas other than Europe where some operational and environmental aspects are considered less problematic (technological acceptability).
- The most plausible scenarios foresee a substantial growth in fleets equipped with both methanol and ammonia engines, once the obstacles relating to the availability of these fuels in «green» form and the creation of the necessary infrastructure have been resolved.



In the decarbonisation processes, the characteristics of the fleet must be taken into account, and it is necessary to consider a two-track process:

- guaranteeing the refueling of the **existing fleet** with low carbon fuels (drop-in) as it is progressively replaced (currently the replacement rate of the fleets can be estimated in the order of 2% per year)
- supporting **new marine vessels** with dual fuel or dual fuel ready engines with logistics that satisfies their refueling needs along the routes.

- It is essential to have a national energy strategy that makes ports energy hubs capable of supplying ships with the different types of fuel that will be available in the future.

- The national logistics system, adequately strengthened, could become attractive and strategic for Italy through a synergy between the national ports and the production sites of hydrogenated biofuels which can provide an effective competitive advantage.

- It is also important to remember that biofuels can offer a possibility of reducing CO₂ emissions not only during sailing but also when stationary in port, at least until cold ironing infrastructure fueled by renewable sources are built.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



The strong growth in demand for new carriers, as a result of policy and regulatory interventions, and at the same time the level of maturity of the marine engine industry (a strong point that also emerged from this study) will determine the speed with which new carriers will spread.

This dynamic, as we have seen, will be conditioned by a series of factors, such as:

- the expected cost for the reduction of greenhouse gases (€/tCO₂_saved);
- the level of sustainability of the production chains;
- the availability of raw materials (feedstock);
- the technological and commercial maturity of the alternatives;
- the need to adapt/build new marine vessels in a very diversified sector where the economic resources are also differently distributed;
- the development of technologies capable of increasing energy efficiency;
- the training of the operators in the sector, especially regarding safety;
- competitiveness with other sectors (e.g. aviation);
- the development of intermodal synergy, one of the main ways to contribute to the ecological transition of transport.

Project structure

PARTNERS ENGAGEMENT



March 16th '23

KOM

WORKSTREAM (coordinators)



RIFA
SUPERVISED BY

DELIVERABLE

International legislative and regulatory context
European legislative and regulatory context
National regulatory framework

Global, Italian fleet and RINA Italian classified fleet
Impact of the energy transition on shipping
Short-medium term prospects (5 years)

State of the technological art
Supply Chains
R&D roadmap
Safety factors
Availability of highly specialized personnel

Power options for the marine transportation of the future
In-depth information sheets for each single energy source

The infrastructure system
Traditional fuels and their bio developments
LNG/BIOLNG, METHANOL, AMMONIA, HYDROGEN

CONFERENCE
JULY 11TH
2023



RESULTS
SHARING



Fit for 55%

FuelEU Maritime Regulation

Reduction of Greenhouse gas emission intensity index vs benchmark

- ❖ -2% by 2025
- ❖ -80% by 2050

Penalty for noncompliance

Emission Trading System Regulation review

Maritime sector gradually entering the ETS

- ❖ 40% GHG emissions (2024)
- ❖ 70% GHG emissions (2025)
- ❖ 100% GHG emissions (2026)

CO₂ quotas bought on the market and
Penalty for noncompliance

IMO Strategy on reduction of GHG emissions from ships (IMO)

Reduction of GHG emissions (vs 2008)

- ❖ 20% (with ambition towards 30%) by 2030
- ❖ 70% (with ambition towards 80%) by 2040
- ❖ 100% by 2050
- ❖ Fuels with zero or almost zero emissions at least 5% of the energy used by 2030

Carbon Intensity Reduction (vs 2008)

- ❖ 40% by 2030
- ❖ 70% by 2050

❖ Emissions measured «Well-to-Wake»

❖ Regulated subject: Shipping Company

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



- The recently updated IMO 2023 strategy has set a target for a reduction in carbon intensity of 40% by 2030, 70% by 2040 and a reduction in GHG emissions of 20% by 2030 and 100% by 2050, compared to 2008 to 2050
- The European Union has adopted legislative measures that will have an impact on maritime transport, such as the revision of the ETS Directive and the new FuelEU Maritime Regulation, which is being finalized. Both requirements will apply to vessels of 5,000GT and above, irrespective of their flag, for voyages between EU/EEA ports, within EU/EEA ports, for voyages to and from EU/EEA ports and to and from non-EU/EEA ports – the latter counted at 50%
- The FuelEU Maritime Regulation requires that, starting from 2025, an annual average greenhouse gas intensity index (GHG) for each vessel that must not exceed a target value, and which will significantly reduce over the years (from 2% in 2025 to 80% in 2050)
- Further provisions in the field of energy dictated by the so-called Fit for 55 package, such as those regarding fuel suppliers, confirm a greater favor for the release of the so called “sustainable” fuels for consumption in the maritime sector by using multipliers to the energy supplied in the phase of quantifying the goals
- The revision of the European Directive 96/2003 on the taxation of energy products (Energy Taxation Directive - ETD) provides that the same road transport tax treatment is applied to traditional fuels used in marine transport, progressively increasing the rate minimum – currently zero – during the 10-year transitional period
- The current EU-RED regulatory framework, implemented in Italy last April, already allows national objectives to be achieved starting from 2023, also through the consumption of biofuels, for use in the maritime sector, constituting an opportunity for decarbonisation of the sector

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

Worldwide Fleet

Growing both in terms of units and – more than double the rate – in terms of tonnage

Amount of tonnage scrapped – replaced

Fleet replacement rate estimated of 2% per year

Worldwide fleet - years of operation

Average age just under 22 years

European shipbuilding and shipbreaking industry

- ❖ 96% of global new tonnage is built and over 98% of tonnage is scrapped in Asia
- ❖ Europe is leader in the cruise sector but marginal in the other types

Focus on Italy

- ❖ Gross tonnage from 6,298 in 2011 to 14,185 in 2022.
- ❖ Number of vessels from 1,467 units in 2021 to 1,266 in 2022
- ❖ Average age 28.9 years in 2022
- ❖ 37% of vessels is unable to comply with CII requirements without further measures

Ship sector ro-ro passengers

Need, more than in other segments, to have production and logistics for alternative fuels

Shipowners' requests

Orientation towards dual-fuel units (traditional and alternative fuels), and dual-fuel-ready units

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



- The world fleet is growing in terms of units and more than double in terms of tonnage as well. Only General Cargo ships are decreasing in number and are almost constant in terms of global tonnage, confirming the evolution that has been going on for decades of "non-bulk" and "non-specialized" traffic towards containers.
- World fleet age data shows an average age of just under 22 years; it should be noted that the average age of the container fleet has been rising in recent years, as new constructions are concentrated in the high tonnage range, against a relatively modest number of demolitions.
- Every year, the amount of tonnage scraped - and therefore replaced with new vessels - is a minimum share of the existing one: it ranges from 2.0% in 2014 to 1.1% in 2021; this indicates that fleet replacement times are currently quite long and need to be accelerated.
- The incidence of the European shipbuilding and shipbreaking industry is marginal compared to the world shipbuilding industry: 96% of the global new tonnage is built and over 98% of the tonnage is scrapped in Asia.
- In Italy, the tonnage went from 16,298 gross tonnage in 2011 to 14,185 gross tonnage in 2022 and the number of ships is decreasing from 1,467 units in 2021 to 1,266 units in 2022.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



The average age of the Italian fleet is quite high, going from 22.0 years in 2011 to 28.9 years in 2022; the average age of the Oil tankers sector has substantially doubled, followed by the passenger transport sector (local passenger transfer), while the fleet is in line with the global average in the world of Ro/Ro pax ferries and very young in the cruises sector.

The impact of the strategies for the reduction of greenhouse gases on national vessels, especially taking the Carbon Intensity Indicator CII as a reference index, shows that only 37% of vessels would be able to comply with the requirements of the CII without further measures. Furthermore, since the CII is an increasingly stringent regulation for each year starting from 2023, the analyzes highlight how, with the same emissions profile, the situation clearly emerges as ever more critical until, after 2025, hypothetically more than 73% of the units not authorized to navigate.

For the ro-ro passenger ship sector, as for other types of ships, there is an obvious need to have immediately available alternative technologies and fuels, in order to be able to comply with the standards and to achieve a real and absolute reduction in greenhouse gas emissions.

From the available information emerges the beginning of a change of orientation regarding the requests of shipowners, namely: dual-fuel units, able to operate immediately with both traditional fuels and with alternative fuels (liquefied natural gas and methanol), and dual-fuel-ready units (for example ammonia ready) equipped with all the design features to be able to be transformed and powered by the second fuel.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

Adoption of multiple and complementary solutions

By 2050, investments by maritime operators will be about 4 trillion dollars

Increase in orders for Dual Fuel Engines (Diesel - LNG)

Dual Fuel Engines (Diesel - LNG) with the ability to be converted to methanol (most) or ammonia (to a lesser extent)

Substantial growth in fleets with both ammonia and methanol engines

In a plausible scenario, when the obstacles relating to the availability of fuels in a more sustainable form, and the creation of the necessary infrastructure are solved

CCS on Board

Experimentation of post-combustion CCS or with technologies that can capture carbon in solid form before combustion is underway

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

ENGINES



- Marine sector decarbonization goals by 2050 will be in the order of 4 trillion dollars.
- In the order backlog, there is an increasing demand for Dual Fuel (Diesel - LNG) engines with the capability to be converted to methanol (most) or ammonia (to a lesser extent) during the vessel's operational life.
- In some segments (e.g. Container Ships, attached below) a strong push for methanol as a new fuel for maritime transport can already be glimpsed from 2023.
- The achievement of the decarbonisation objectives by 2050 is based on the adoption of multiple and complementary solutions, where no single solution would exceed 1/3 of global demand. This scenario takes into account the reality of the future availability of new more sustainable fuels (ammonia, methanol, hydrogen), which will not be able to satisfy 100% of demand, and also the physiological renewal times of the global fleet.
- A plausible scenario foresees a substantial growth in fleets equipped with both ammonia and methanol engines, once the obstacles relating to the availability of these fuels in a more sustainable form (construction and activation of production sites powered by renewable electricity), and construction of the necessary infrastructure have been resolved, especially for ammonia, which is not yet internationally regulated for use as fuel.
- By 2025, methanol and ammonia-fueled engines, as well as conversion solutions that enable diesel and dual-fuel -DF engines to use these fuels, will be available from all manufacturers.
- According to IMO forecasts, the LNG fleet will continue to grow, becoming dominant by 2050 and will surpass the heavy naphtha fleet by tonnage.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

Fuels capable of reducing CO₂ emissions

Already present on the market with use of existing infrastructure, with use both in blends and in purity

Ammonia, Methanol and Hydrogen

Long-term options with potential for development, in the light of an adjustment of infrastructure and logistics

Bio-LPG and e-Fuels

Complementary and long-term options that would not require infrastructural adjustments

HVO – FAME

Biofuels immediately available with different performances (with HVO being more suitable in engines and for logistics)

LNG – Bio LNG

Infrastructure under development.
Emission reduction:

- ❖ Fossil – about 25%
- ❖ Bio emissions close to zero

Fuel Cost

Definitely higher for alternative fuels than conventional fuels (two to 5-6 times higher) which will be affected by ETS

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



International environmental legislation on maritime transport is being developed both within the IMO and within the EU to regulate CO₂ emissions and to facilitate the production and dissemination of the so-called “sustainable alternative fuels” for ships.

The fuels capable of reducing CO₂ emissions and more easily usable can be identified in biofuels produced widely on the market which do not require logistic infrastructure, other than the traditional fossil bunker and which can be used in current marine engines both in mixtures with petroleum products and be in purity.

HVO - Hydrotreated Vegetable Oil and biodiesel - FAME are the most immediately available.

At the same time, LNG, whose infrastructure is being developed, can immediately make significant contributions.

LNG in its fossil version reduces CO₂ by about 25% while in its Bio version it can reach close to zero emissions. In the medium to long term, greater diversification of ship fueling options is expected.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



Bio-LPG, rDME, Ammonia, Methanol, e-Fuels and Hydrogen are the medium and long-term options with development potential, in the face of an adjustment of infrastructure and logistics (see Potential bunkering, source Clarksons 2023). Together with biofuels and Bio-LNG, which will continue to be present in the long term, they are solutions whose advantages and disadvantages have been the subject of careful study in order to provide marine armament with the multiple elements which will need to be taken into account in order to be able to exercise the more correct operational choices.

In the context of these assessments, a fundamental role is played by the cost of fuel, as evidenced by the Annex Alternative fuel Pricing figure, drawn up by Clarksons with data for 2022, which shows that alternative fuels still have particularly high costs compared to conventional fuels (from two to 5-6 times greater) and that, in the presence of an ETS system also in maritime transport, the advantage deriving from lower CO₂ emissions reduces this gap, but it will still take some time before parity of price is reached.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

Focus on Italy

Capillary network of infrastructure dedicated to the bunkering service, including vehicles (so-called barges) that carry out the refueling service

Traditional fuel infrastructure

Ready and available for liquid bio products

Volumes of bunkers handled in Italy

Not commensurate with the maritime traffic of Italian ports

Methanol and ammonia from bio and renewable processes

Lack of availability of infrastructure ready to guarantee bunkering

LNG and bio-LNG

Over the past 10 years, an infrastructural network of depots has been developed as well as upgrading projects

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



- Italy has a capillary network of infrastructure also dedicated to the bunkering service, including the vehicles that carry out the refueling service (so-called barges).

- The infrastructure (refineries and depots) and the fleet of ships currently available on the national territory serving the maritime bunkering of fuels and traditional products are already available to receive products of bio-origin (liquid biofuels), thus allowing full exploitation of existing assets by rationalizing the costs of the decarbonisation process.

- In the last 10 years, our country has developed an infrastructural network of depots which offer the possibility of having LNG available (and increasingly more bio-LNG), as an alternative fuel for the propulsion of ships and, at the same time, as energy for services on board the vessel.

- There are also existing infrastructure upgrading projects (in particular the regasification plants already installed and functioning) in order to be able to offer LNG bunkering services from ship to ship (ship to ship) or from depot to ship (shore to ship), thus such as new infrastructure projects to increase the availability of LNG and bio-LNG.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



■ The volumes of bunkers handled in Italy are not commensurate with the maritime traffic of our ports, which would therefore have great potential to further develop this sector by recovering market shares, also given the geographical centrality of our country in the Mediterranean basin.

■ The methanol and ammonia carriers produced by bio and/or renewable processes suffer from the substantial lack of the availability of infrastructure ready to guarantee the possibility of bunkering the two products in our area. The international framework reveals a situation in the medium term, in which the availability of these fuels will be limited to specific areas, therefore the use limited to those operators who travel on fixed routes with long-term contracts. It is therefore possible to assume that the "spot" operators will have great difficulty in procuring these fuels for several more years.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

Short and medium-term solutions (≥ 10 years)

Brief methodological note

The methodology adopted aims to «valorize» the energy vectors according to nine parameters, with an overall weight of 100 for each single vector. the scoring of each parameter ranges from 0 to 10, except for CO₂ emissions with a value from 0 to 20.

The attribution of the value to each parameter is based on:

- acquisition of information from open sources (e.g. DNV, Clarksons, RINA, fuel market price trends, projects financed by the PNRR)
- contents emerged in the working groups
- comparison among experts (Delphi method – Focus group).
- A value associated with a chromatic scale on a percentile basis was then determined for each parameter, in order to represent the level of satisfaction of the optimal conditions of the parameter.

AS IS Scenario

The sum of all the parameters associated with a single energy vector has made it possible to build a tendential positioning regarding the potential expressed by each energy vector to achieve the decarbonisation targets. The carriers were ordered according to the potential expressed, with respect to the current engine set-up of the world fleet in use (99% of the ships use liquid bunkers) and to the ship orders.



TO BE Scenario

The to be scenario (10 years), built considering the fulfillment of some enabling conditions, expresses trends strongly influenced by technological innovation, by the adaptation of infrastructure and by related investments.

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

Parameters

CO₂ emissions	Value according to the production of carbon dioxide emitted into the atmosphere by fuels, not only during their combustion, but along the entire "Well to Wake" chain, i.e. from the entire fuel production process, to delivery, use and on board ships and all produced emissions.
Performance	Value according to the effect of the fuel on the performance of the vessels and on the proper functioning of their engines
Safety	Value according to the fuel flash point (PI>60° = green)
Availability	Value according to the available and forecasting production capacity of the industrial system
Price	Value according to the trend of the current and forecast market price
Cost of emissions (ETS and FUELEU MARITIME)	Value according to both the cost of CO ₂ quotas in the context of the European Union Emissions Trading System, and the penalties identified for non-compliance in the Marine Regulations
Infrastructure	Value according to the current and potential availability of the logistics assets network
In operation vessels	Number/tonnage of vessels in use
Ship on order	Number/tonnage of vessels in the order book

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

FLEET EVOLUTION

TIME	EXPECTED SHIPS GROWTH RATE ¹	GLOBAL ENGINE ORDER PORTFOLIO ² (NEW BUILD & RE-ENGINEERING)				
		Mono Fuel (fossil, biogenic or synthetic origin)	Dual Fuel			
			LNG ³	Methanol ³	Ammonia	Hydrogen
Within 5 years						
Within 10 years						
Over 10 years						

¹ As of 2021 it was equal to 2.1 in terms of tonnage.

² See Clarksons. The forecasts are conditioned by the developments of CCS on board ships and the long-term development of e-fuels.

³ Fossil, biogenic or synthetic origin.

LEGEND

GROWTH EXPECTATION



INCIDENCE % NEW ORDERS



THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



AVAILABILITY AND PERFORMANCE – AS IS

FUEL¹

(unit of product placed on the market)

PARAMETERS	Weights	HVO	FAME	Bio LNG	BIO LPG	Bio Methanol	LNG ²	LPG ²	Methanol ³	Ammonia ³	Hydrogen ³
	CO ₂ emissions	20									
	Performance	10									
	Safety	10									
	Availability	10									
	Price	10									
	Cost of emissions (ETS and REFUEL EU)	10									
	Infrastructure	10									
	In operation vessels ⁴	10									
	Ship on order ⁴	10									

Overall rating 100 92,5 75 70 65 56 53,5 51 39,5 37,5 37,5

¹ In relation to technological maturity, e-fuels and rDME have not been taken into consideration in the table.
² LNG, LPG and Methanol have a lower emission content than the traditional fossil bunker
³ The evaluation was applied exclusively to ammonia and “green” hydrogen
⁴ Source: Maritime Forecast to 2050 by DNV (2022 edition)

Satisfaction of single parameter conditions



THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

ENABLING CONDITIONS- 10 YEARS

AVAILABILITY

Effective date of the regulatory provision

Investments by producers of bio, “green” and synthetic energy vectors

PRICE

Cost of the ETS and value of the Marine Reg. penalties

Implementation of CCS technology on board

Market dynamics supply / demand in favor of bio, “green” and synthetic fuels

INFRASTRUCTURE

Construction of infrastructure and upgrading of support logistics

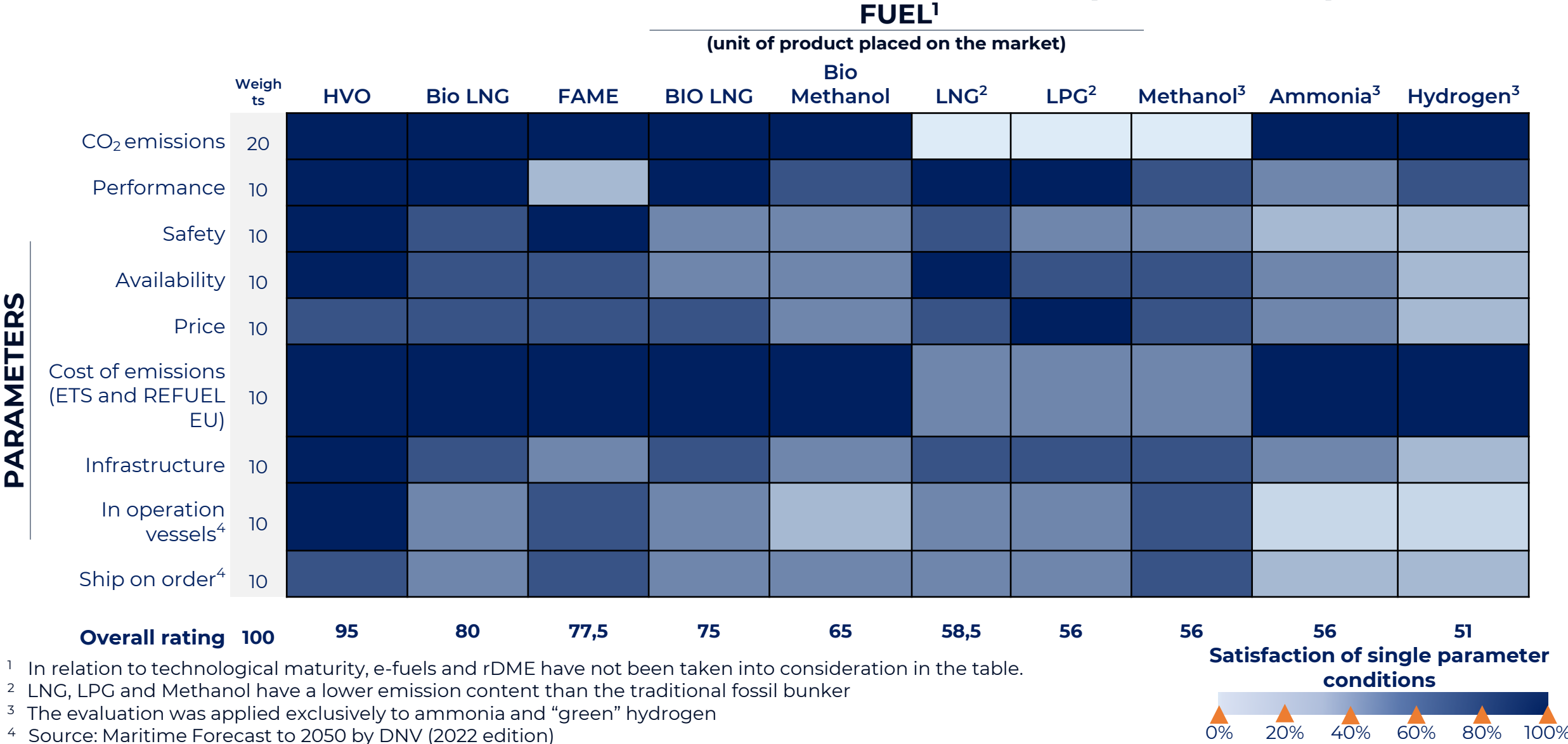
FLEET EVOLUTION

Limited replacement of the fleet, with necessary adjustments to respond to EU and IMO targets

Progressive increase in Dual Fuel engines

THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023

AVAILABILITY AND PERFORMANCE – TO BE (10 YEARS)



THE ROUTE TO NET ZERO. TOGETHER TO DECARBONISE THE MARITIME SECTOR – July 2023



FEDERCHIMICA
ASSOGASLIQUIDI



WIN GD

eni 



Approximately **99%** of the number of ships and 95% of the tonnage of the world fleet is powered by **fossil fuels**

The **regulatory interventions** of the European Commission enable the competitiveness of low-carbon energy vectors. The effectiveness of these interventions is guaranteed by internal harmonization within the EU, by creating extra-EU competitiveness accompanied by acceleration at international level (IMO) on the assessment of fuels throughout their life cycle.

Bio-fuels represent one of the decarbonization solutions for immediate use (in purity - blending - drop in), their production sizing represents a strategic factor

The development of the **infrastructural system** serving the different types of **traffic** will favor the penetration of new generation carriers

In the short term, the development of infrastructure for **LNG** would favor its penetration; the lack of dedicated infrastructure penalizes the competitiveness of **methanol, hydrogen and ammonia**

Mono Fuel engines, assisted by **CCS**, also maintain an important role in the medium/long term. The incremental solution is the **Dual Fuel** ad LNG which will gradually be joined by methanol and ammonia.

THE ROUTE TO NET
ZERO.
TOGETHER TO
DECARBONISE THE
MARITIME SECTOR.



ASSARMATORI


CONFITARMA
Confederazione Italiana Armatori

RINA **UNEM**
unione energie per la mobilità

 **FEDERCHIMICA**
ASSOGASLIQUIDI
Associazione nazionale imprese gas liquefatti

 **ASSOCOSTIERI**
LA LOGISTICA DELL'ENERGIA

 **MAN**
MAN Energy Solutions

 **WÄRTSILÄ**

WIN GD

eni 